

This year the IPLA Special Edition will be dedicated to best practices in the following curricular areas: *Reading, Math, Science, and Social Studies*. The focus of this issue is **Math**. Distinguished Indiana school leaders have shared methods and strategies for improving math strategies.

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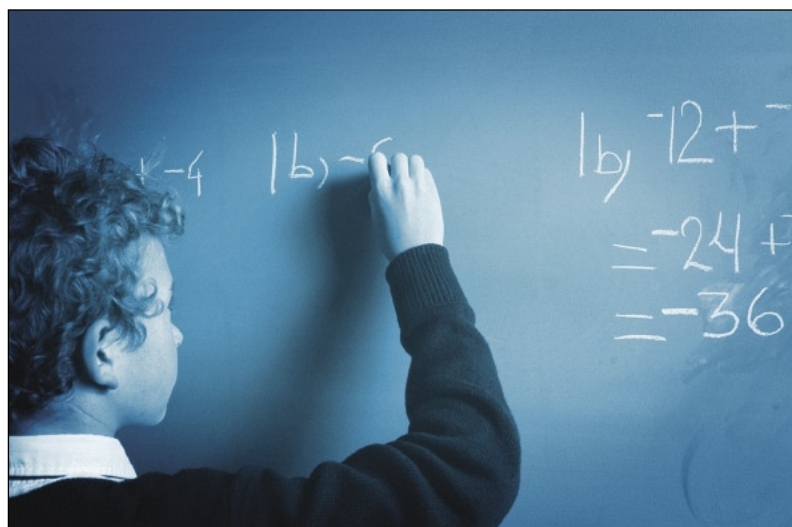
Calendar

## Effective Mathematics Instruction

*Donna Osborn, Mathematics Teacher, Lafayette Jefferson High School, Lafayette, Indiana*

**T**eaching mathematics well is a complex endeavor, and there are no easy recipes for helping all students learn or for helping all teachers become effective" (*NCTM Principles and Standards*, 2000). However, research has shown that effective mathematics instruction takes place in a student-centered classroom where the standards-based curriculum provides students the opportunity to solve worthwhile mathematical tasks. Research evidence also indicates that the effective teacher believes each and every student can learn and understand mathematics.

A student-centered classroom is an actively engaged community in which students feel comfortable knowing that mathematical talent can be expressed in many ways. Of course, the teacher creates the atmosphere of acceptance, plans the lessons, nurtures the students as they begin to express their views, and analyzes the student interaction.



### WHAT ARE STUDENTS DOING IN A STUDENT-CENTERED CLASSROOM?

- Interacting with each other
- Using a textbook as one of many different resources
- Applying mathematics to real-life situations
- Seeking the best solution to problems with several options
- Testing solutions to problem situations
- Communicating (oral and written) mathematical ideas and concepts
- Helping each other learn

Using the mathematics standards for Indiana as a framework for the curriculum, effective mathematics teachers group the benchmarks into standards-based units of instruction. Then the lessons are developed using appropriate instructional strategies for each procedural or declarative benchmark. *Classroom Instruction That Works* provides instruction on how to implement the nine most effective instructional strategies that enhance student achievement for all students in all subject areas and at all grade levels.

*(continued on page 6)*

# MEASURING SUCCESS... One Student at a Time

January 26-27, 2004

14<sup>th</sup> Annual  
IPLA Winter  
Conference

WINTER CONFERENCE

MEASURING SUCCESS  
One Student at a Time



## HARRY WONG

Harry Wong is a renowned educator and speaker. His practical, useful techniques for classroom success have been used by thousands of educators world-wide. Author of The First Days of School: How To Be An Effective Teacher, Dr. Wong focuses on classroom management and student success.



## JOE CLARK

Joe Clark, the former principal of Eastside High School in Paterson, NJ, will share his strategies and stories of student success. He has demonstrated how commitment to children can make America's future leaders better citizens and better people.

- Annual Breakfast
- Over 25 Breakout Sessions
- Legal Update

Please visit [www.doe.state.in.us/ipla](http://www.doe.state.in.us/ipla)  
for the agenda.

indiana principal leadership academy

# WINTER CONFERENCE

**January 26-27, 2004**  
**Sheraton Indianapolis Hotel & Suites**  
**Indianapolis, Indiana**

Name \_\_\_\_\_ IPLA Group Number \_\_\_\_\_  
(if applicable)

First Name for Name Tag \_\_\_\_\_

Position: ☐ Principal ☐ Teacher ☐ Superintendent ☐ Other  
(check one)

Corp/Organization Name \_\_\_\_\_

Corporation Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

School Name \_\_\_\_\_

School Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Phone \_\_\_\_\_ E-Mail Address \_\_\_\_\_

Home Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

## Participant Registration

### Regular Registration

**\$150**

This covers the cost of registration,  
a continental breakfast on Day 1,  
and a buffet breakfast on Day 2.

Total Amount Enclosed \_\_\_\_\_

Please check method  
of payment.

☐ Check # \_\_\_\_\_

☐ PO # \_\_\_\_\_

Make checks payable to:  
IPLA Alumni Association

## CRU Request

If you are interested in receiving 8 CRUs  
for this conference please provide  
your Social Security Number below.

\_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_

**Registration Deadline is January 22, 2004 • No Refunds After January 23, 2004**

Make checks payable to IPLA Alumni Association, Inc.

Mail registration form to:

**Krista Orton - IPLA - Room 229, State House - Indianapolis, IN 46204**

Telephone: (317) 232-9004 Fax: (317) 232-9005



## A Practical Approach to Professional Development in Mathematics

**Paul Smith**

*Paul works with professional development for Evansville-Vanderburgh School Corporation's Title One program. He also teaches classes with Indiana Wesleyan's Masters of Education program. E-mail: psmith@evsc.k12.in.us*

This, being book adoption year for mathematics in the state of Indiana, is an excellent opportunity to lead your staff in the improvement of mathematics instruction. Here are some proposals to help move professional development forward in your schools.

### Honestly assess your own need as a building leader to know more about math and make a personal plan for improvement.

The principal's classroom teaching background and past experiences with mathematics will determine what he/she needs to learn about mathematics curriculum and instruction. Join a mathematics professional organization, such as the NCTM (National Council of Teachers of Mathematics). When a principal models for teachers how to enhance in particular areas, then the teachers will follow the lead.



### Knowing what your teachers need in mathematics professional development helps you to focus your efforts.

A leader knows what the professional needs of his/her staff are and attacks those areas. Using questionnaires, teacher's professional development plans, free writes, test data and professional conversations, a principal can assimilate the deficient areas. These areas of concern might lie in curriculum, instruction, or assessment. Differentiated instruction, inclusion, or standards may be issues that are paramount to teachers. Find the area of concern and focus, focus, focus.

### Teachers will not agree to change unless they see a need.

Just telling teachers that they have to do better, is not going to create long-term effects in mathematics teaching in a school. Depending on the status of a school's performance, the need for change may or may not be apparent. In the United States, students are not as competitive in mathematics with students from other nations. The need to see a larger number of students succeeding in higher mathematics is universal in the United States. Using test data, journal articles about successful schools with similar demographics, instructional audits, teacher self-evaluations and formal evaluations are means to help teachers see a need for change. Instead of placing the blame on external circumstances as to why students do not excel in mathematics, schools must concentrate on improving the conditions they can control.

### Clearly define what good teaching is and help teachers to know and practice it.

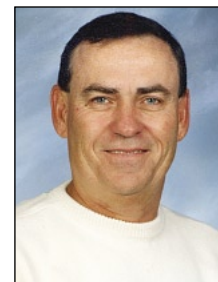
There is a growing body of evidence of what good mathematics teaching

*(continued on page 6)*

## Math Problem Solving The Lost Standard?

**Bob Trammel**

*Instructor Indiana Purdue University Fort Wayne  
Former Mathematics Curriculum Coordinator Fort Wayne Community Schools*



We all know that math basic skills are very important. Just ask about any elementary teacher or parent and the words "teach those math facts" will spill from their mouths.

True, number facts are very important, but mathematics is more than numbers.

What about reasoning and thinking skills? How do these process skills correlate with basic number facts?

The real difficulty in math education today is the flawed idea that students cannot problem solve without basic number facts. Certainly having a firm foundation of number facts is beneficial but does not guarantee a student is a great problem solver.

The same fundamental idea holds for language arts. Proficiency in grammar does not guarantee proficiency as a writer. Some students can naturally write without a firm understanding of grammar rules. The same applies in mathematics as some students are not great at computation but are good problem solvers.

In the curriculum of many schools, computation seems to be the big target at grades K-6. Computation has also received the attention of most of the K-8 standards listed in Indiana's Academic Standards (mathematics). However, exposing students to problem solving items will increase reasoning and thinking skills that nearly always concludes with some kind of necessary computation work.

Teachers may be reluctant to pose problem-solving situations to their classes for a variety of reasons. Examine the components needed for effective problem solving and it is clear why some teachers find problem solving difficult to teach and manage.

### Problem Solving Components

- Reading comprehension—literacy skill
- Selecting a strategy for the problem—reasoning skill
- Constructing a solution—sequencing skill
- Troubleshooting—thinking skill
- Justifying the solution to others—communication skill

Also consider that most teachers have no pre-service training in this area. In order to implement effective problem solving skills into the classroom, teachers must be supported by professional development. Here are some areas to consider for professional development focusing on problem solving techniques.

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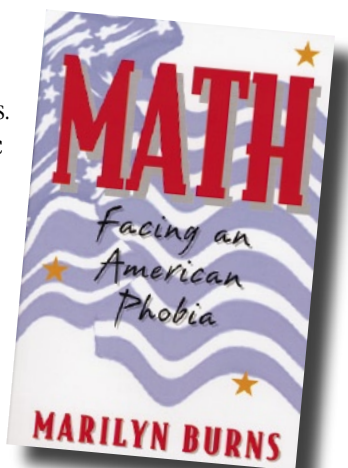


## BOOKS FOR LEADERS

### Math: Facing an American Phobia

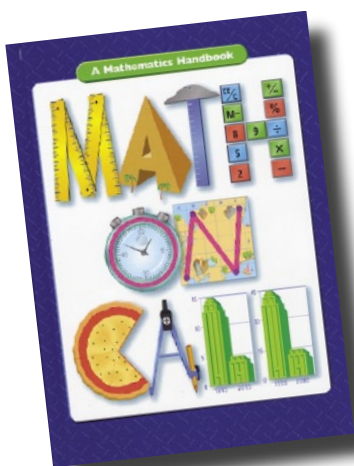
By Marilyn Burns

“More than two-thirds of American adults fear and loathe mathematics. Math is right up there with snakes, public speaking, and heights. But it does not have to be that way. This book looks at why math has the dreadful reputation it does. It laughs at itself, while it sneaks its message through about what math can and should mean to us all and how we can keep our children from adopting the negative attitudes about math. You’ll not only be entertained as you read, but you’ll also find yourself thinking about mathematics and liking it.”



### Math on Call

By Great Source Education Group, Andrew Kaplan

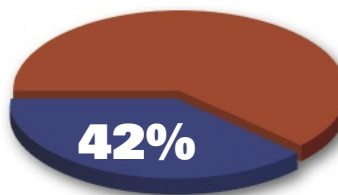


“The ultimate math resource for school or home, *Math on Call* has everything you will need for math success.

- Numeration
- Number theory
- Computation
- Algebra
- Graphs and Statistics
- Geometry
- Ration, Proportion, and Percent
- Probability and Odds

Math on Call includes a handy Almanac with math prefixes and suffixes, problem solving strategies, study tips, guidelines for using spreadsheets and databases, test taking strategies, helpful lists and tables, and more.”

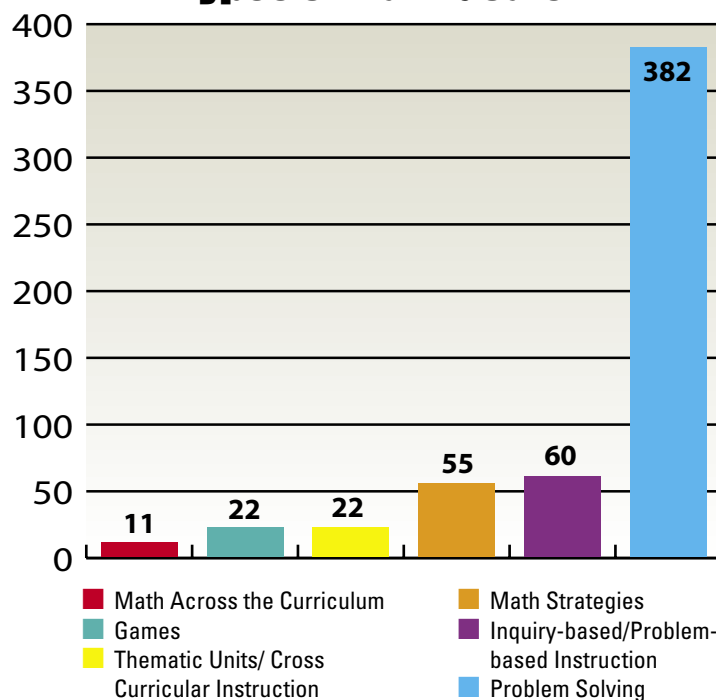
### Public Schools With a Math Goal



Out of 1,972 schools, 827 (or 42%) have math goals.

Below is data gathered from the Indiana Department of Education on public schools that have utilized math goals as part of their P.L. 221 plans. All data is taken from the October 1, 2002 reporting date.

### Types of Math Goals



### QUOTE CORNER

*I advise my students to be careful the moment that they decide to no longer take mathematics courses. They might be able to hear the sound of closing doors.*

— James Caballero



*SMITH continued on page 4*

looks like and the results it brings in higher student achievement. The professional standards board has developed teaching standards for what we expect beginning teachers of mathematics to be able to demonstrate (<http://www.state.in.us/psb/standards/MathematicsContStds.html>).

Principals should ask nothing less of all mathematics teachers. Leading your teachers to embrace these practices and holding them accountable is an enormous task. Walking through classrooms on a consistent basis, observing and commenting on instructional practices will help reinforce good teaching strategies.

### Create opportunities for teachers to talk professionally about teaching mathematics.

Time, time, time, if teachers just had more time. Principals can creatively look for ways to imbed professional development within the school day. Use professional development money for substitutes to buy structured time for teachers to work together. During assemblies, provide alternatives for supervision to allow teachers to meet on particular matters of mathematics. Principals can use regular scheduled faculty meetings to focus on professional development. Experiment with various scheduling alternatives to allow teachers time to work together.

*TRAMMEL continued on page 4*

- Learn how to establish and manage cooperative learning groups
- Learn how to ask questions to students that will promote critical thinking
- Learn how to use problem solving as a support for basic math skills
- Learn how to get students to read, write, and orally explain solutions

Other resources to teach problem solving skills are the released Applied Skills section of the ISTEP+ tests and the Curriculum Frameworks Lesson Plans. These resources are free and accessible via the IDOE website at [www.doe.state.in.us](http://www.doe.state.in.us) under the Academic Standards and ISTEP+ Info Center buttons on the home page.

Do not let problem solving be the lost standard. This is an important standard that is connected to all of the other content standards. Problem solving is an exciting vehicle to support best instructional practices for teachers and learning strategies for students. Problem solving is a great way to help students learn mathematics and perform better on all assessments.

*OSBORN continued on page 1*

### CATEGORIES OF INSTRUCTIONAL STRATEGIES THAT AFFECT STUDENT ACHIEVEMENT

- Identifying similarities and differences
- Summarizing and notetaking
- Reinforcing effort and providing recognition
- Homework and practice
- Nonlinguistic representations
- Cooperative learning
- Setting objectives and providing feedback
- Generating and testing hypotheses
- Questions, cues, and advance organizers

As these standards-based lessons are planned, worthwhile mathematical tasks are the key to student achievement, motivation, and engagement. Whether these tasks are connected to the real world or are mathematically abstract, they should be intriguing to students, require mathematical reasoning and problem solving, and have multiple methods of solution. The teacher's responsibility is to decide what aspect of the task to highlight, organize the way the students will work together, develop the questions to ask, and decide how to support the students without taking over the process of thinking. Good tasks embed skill development in the context of problem solving. However, although worthwhile tasks are difficult to find and develop, the NCTM ([www.nctm.org](http://www.nctm.org)) website and NCTM publications are excellent sources for problems. In addition, five exemplary mathematics programs, rated by the U.S. Department of Education, contain a wealth of worthwhile tasks ([www.enc.org/professional/federal/resources/exemplary](http://www.enc.org/professional/federal/resources/exemplary)).

Since students learn through the experiences that the teacher provides, the

teacher is the key factor in the learning cycle. Effective mathematics teachers view mathematics holistically, creating continuity between the mathematics topics in the curriculum. As the lessons progress, teachers analyze what they and their students are doing and then make appropriate adjustments. By assessing their students' progress, the teachers align their formal assessments with the standards and then use that evidence to modify the curriculum or instruction.

In summary, students achieve more when they are actively involved in mathematical modeling or problem solving. Teachers provide the worthwhile mathematical tasks and the opportunities for students to link the new knowledge with previously learned material. Together the teacher and students share the attitude that all can learn and do mathematics, set the goals for all to achieve, and then work to increase everyone's mathematical knowledge.

Apthorp, Helen S., Bodrova, Elena, Dean, Ceri B., and Florian, Judy E. (2001). Noteworthy Perspectives: Teaching to the Core – Reading, Writing, and Mathematics. Aurora, CO: McREL.

Marzano, Robert J., Pickering, Debra J., and Pollock, Jane E. (2001) Classroom Instruction That Works Alexandria, VA: Association for Supervision and Curriculum Development.

National Council of Teachers of Mathematics (2000). Principles and Standards for School Mathematics, Reston, VA: NCTM.

National Council of Teachers of Mathematics (1991). Professional Standards for Teaching Mathematics. Reston, VA: NCTM.

Sutton, John, and Krueger, Alice (Eds.) (2002). EDThoughts: What We Know About Mathematics Teaching and Learning. Aurora, CO: Mid-continent Research for Education and Learning.



## MATH UPDATE: Information Educators Should Know

*Michael Roach*  
Mathematics Consultant  
Indiana Department of Education

The introduction of Indiana's Academic Standards for Mathematics has lead to a number of changes in the mathematics curriculum. In particular, the next couple of years will feature changes to the high school mathematics courses that can be offered, additional changes to the ISTEP+ program, and the extension of the End-of-Course Assessment (ECA) program.

### HIGH SCHOOL MATHEMATICS COURSES

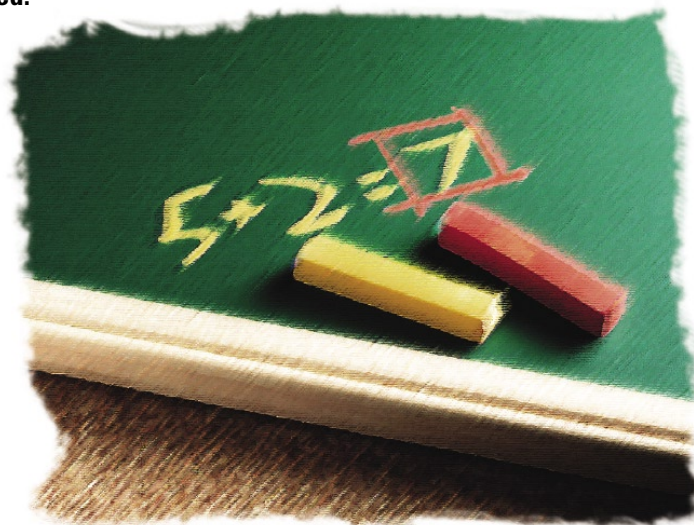
On November 22, 2002, the Indiana State Board of Education resolved that it is "desirable . . . [that] Grade 9 students will start their high school mathematics studies at a level no lower than the first year of a two-year Algebra I program, and, preferably, all Grade 9 students will start a one-year program, with intensive instruction provided as necessary."

#### Beginning Fall 2004, the following high school mathematics courses can be offered:

- Mathematics Lab
- Pre-Algebra
- Algebra I
- Algebra II
- Geometry
- Investigative Geometry
- Integrated Mathematics I
- Integrated Mathematics II
- Integrated Mathematics III
- Pre-Calculus/Trigonometry
- Probability & Statistics
- Discrete Mathematics
- Calculus, Advanced Placement
- Statistics, Advanced Placement
- Mathematics, College Credit

Mathematics Lab is a math elective and does not count toward the math requirement for graduation. It is intended to provide an opportunity for individualized instruction designed to help students successfully complete high-level work in mathematics.

Integrated Mathematics I, II, and III integrate the standards found in Algebra I, Geometry, and Algebra II. Students beginning the Integrated Math sequence should intend to take all three courses. It is not appropriate for students enrolled in Integrated Math to also be enrolled in Algebra I, Geometry, and/or Algebra II since these courses cover the same content.



### ISTEP+

In Fall 2003, ISTEP+ was given to students in Grades 3 through 10. Grades 3 through 9 students were assessed on the "new" Standards adopted in 2000. The GQE was still based on the "old" Essential Skills. Members of the Class of 2007 will be the first required to meet new and higher standards on the Graduation Qualifying Exam (GQE) as sophomores in Fall 2004. Classes that follow will also need to meet these higher standards. In Fall 2004, there will be two GQEs, the "old" one for retesting students and the "new" one for sophomores.

The Grades 7, 8, and 9 ISTEP+ mathematics assessment consists of three different types of items: multiple choice, open ended, and gridded response. Students are also now provided a reference sheet of formulas to use when taking these assessments, rather than having the formulas embedded in the items.

Calculators are not required on ISTEP+; however, students are allowed to use their own calculators (with certain exceptions) on some sections of the Grades 7, 8, and 9 assessments. All items on those tests can be answered without the use of a calculator. For open-ended items, students should write down the process for solving the problem even if they use the calculator to do the actual computation.

As in the past, only calculators provided by the state were used on the Fall 2003 GQE. The calculator policy for the Fall 2004 "new" GQE will be the same as the Grades 7, 8, and 9 policy.

### END-OF-COURSE ASSESSMENTS

An End-of-Course Assessments for Algebra I was piloted in Spring 2003. The schedule for the mathematics assessments is:

- Algebra I – operational in the 2003-2004 school year
- Geometry – pilot in Spring 2004, operational in the 2004-2005 school year
- Algebra II – pilot in Spring 2005, operational in the 2005-2006 school year.

Questions? Contact Michael Roach at [mroach@doe.state.in.us](mailto:mroach@doe.state.in.us) or 317-232-9102.





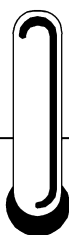
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# C A L E N D A R



### November 6-7 and January 23

Test Data – Now What? Workshop

(open to all educators - see application on IPLA web site)

### November 12

Roger Taylor – Motivating Students Whether

at Risk or Gifted, Sheraton Indianapolis Hotel and Suites

### November 12-13

Groups 39 and 40 Sessions

Sheraton Indianapolis Hotel and Suites

### January 26-27

14th Annual IPLA Winter Conference

Sheraton Indianapolis Hotel and Suites

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